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This volume is dedicated to Dr. Rainer Zangerl

The Mammalian Fauna of Warwasi Rock Shelter, West-central Iran

PRISCILLA F. TURNBULL
RESEARCH ASSOCIATE
FIELD MUSEUM OF NATURAL HISTORY

The archaeological site known as Warwasi rock shelter lies some 19 km. northeast of Kermanshah, in the Tang-i-knisht valley, Kurdistan province, in west-central Iran. Altitude is ca. 1300 m.(= 4260 ft.). The shelter was initially sampled by the Fourth Southwestern Asiatic Prehistoric Expedition of the Oriental Institute of the University of Chicago, Professor Robert J. Braidwood, Director, in winter and spring of 1960. Braidwood et al. (1961) first described the site, indicating it contained a sequence of flint and blade industries from Mousterian through Baradostian and Zarzian stages. Although no radiocarbon determinations are available, the sequence was conformable and thus the shelter apparently was inhabited from at least 40,000 to 10,000 YBP. Reed (1962) studied the modern land snails living on the hillside in the vicinity of the shelter and the prehistoric snail shells contained within the cave. He gave additional environmental data for present-day climate, rainfall, and vegetation. Bruce Howe, of the Peabody Museum, Harvard University, supervised the excavation of Warwasi and I am indebted to him for a reconstruction of the shelter and for field notes giving essential stratigraphic information. The area of the operation in Warwasi was approximately 8 sq. m. It was excavated at 10 cm. levels to depth of 5.6 m.

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This paper is a report on the prehistoric mammalian bones from Warwasi. The work was under the general direction of Professor Charles A. Reed, University of Illinois at Chicago Circle.

Initially, it was planned that the archaeological report of Warwasi would include descriptions of the cultural, as well as the biological, contents of the shelter. Unfortunately, the cultural record has not yet been prepared for publication, although more than a decade has passed since the site was dug in 1960. Therefore, with some reluctance, I am sending this paper into the world as an orphan, without cultural context, but with the hope that it will be useful to other prehistorians working in the near-east.

Charles A. Reed has given me help and constructive criticism during the preparation of this report; he has kindly permitted me to use a photograph he took of the shelter and his map of the area. I also thank the Museum authorities for permission to use pertinent collections for comparative purposes. The study has been supported by various National Science Foundation grants to Dr. Braidwood, and by the Oriental Institute.

Abbreviations in Tables 1-3: L = length; N = number of specimens measured; OR = observed range; M = mean; s = standard deviation; V = coefficient of variation.

TABLE 1. Comparison of measurements of molars of three collections of hemiones *(Equus hemionus)* from the Zagros area, spanning approximately 40,000 years.

	Length M^3 in mm.	Length M_3 in mm.
Iran		
Recent	N=2 OR=25.6-26.8 M=26.2	N=2 OR=28.4-28.8 M=28.6
Warwasi shelter		
Zarzian	none complete	----------
Baradostian	N=1 29.9	N=2 OR=32.0-32.5 M=32.3
Mousterian	N=1 31.2	N=5 OR=23.2-36.4 M=30.5 ± 2.7
Palegawra cave		
Zarzian	N=24 OR=19.6-26.0 M=22.7 ± 0.03	N=21 OR=22.2-32.0 M=26.8 ± 0.46

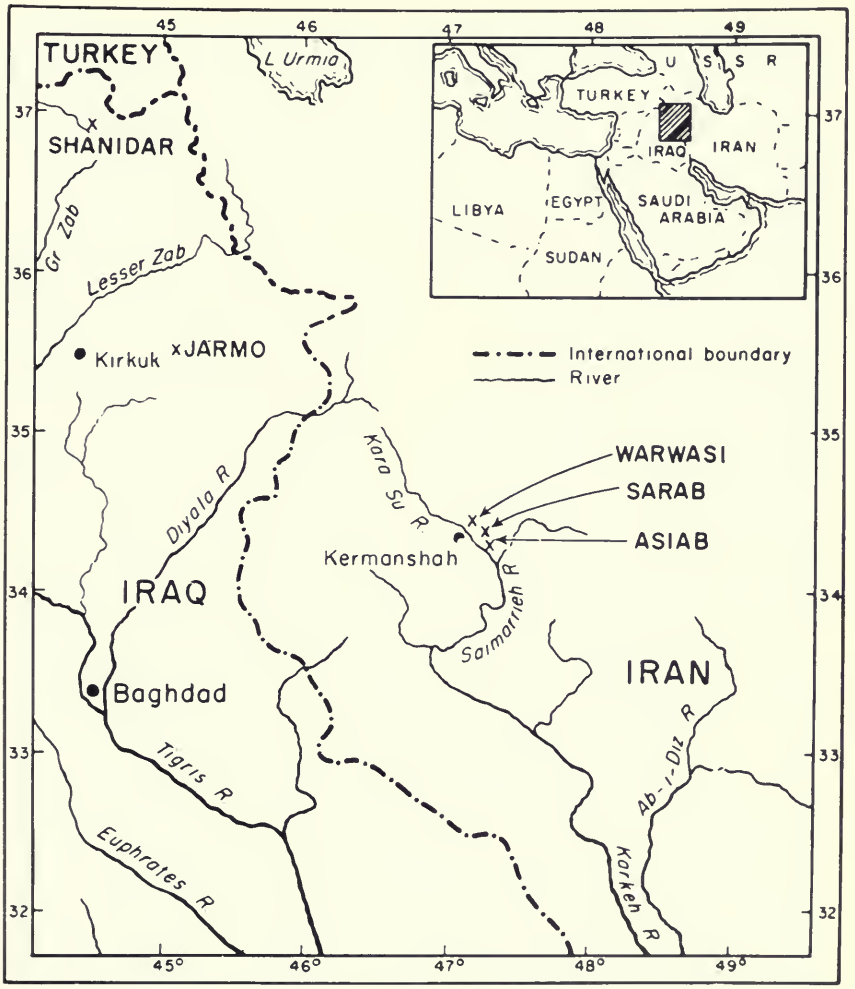


FIG. 1. Map of the area discussed, showing the archaeological site Warwasi. Reprinted with permission from *Postilla* (Peabody Mus. Nat. Hist., Yale Univ.).

Compared with mammalian remains from Palegawra cave, northeastern Iraq, which were studied in great detail previously (Turnbull and Reed, 1974), the contents of Warwasi shelter, though covering a much greater time span, are meager and fragmentary. Very few cattle, sheep, or goat bones occur. Bones of rodents, lagomorphs, and teeth of wild onager predominate. There are no large numbers of indeterminate bone fragments. In fact, the general impression of the collection is that butchering and most meat

FIG. 2. Interior of Warwasi shelter, showing trench dug by Dr. Bruce Howe and Kurdish workmen. Photograph from a 35 mm. transparency by C. A. Reed. Print enlargement by John Bayalis, Dept. of Photography, Field Museum.

consumption was accomplished away from, or at least outside of, the shelter.

The faunal list is arranged by stages, the oldest at the bottom in stratigraphic order.

Zarzian stage:

Equus hemionus, wild ass, onager, hemione
Capra hircus aegagrus, wild goat
Capra/Ovis, indet. wild goat/sheep
Sus scrofa, wild pig
Hyaena sp., hyena
Meriones cf. *persicus,* Persian jird
Ellobius cf. *fuscocapillus,* mole vole
Microtus cf. *socialis,* social vole
Ochotona cf. *rufescens,* pika
Lepus cf. *capensis,* hare

Baradostian stage:

Equus hemionus
Capra hircus aegagrus
Ovis orientalis, wild sheep
Bos primigenius, wild cattle
Canis lupus, wolf
Meriones cf. *persicus*
Allactaga sp., jerboa
Ellobius cf. *fuscocapillus*
Ochotona cf. *rufescens*
Lepus cf. *capensis*

Mousterian stage:

Equus hemionus
Cervus elaphus, red deer
Bos primigenius
Capra hircus aegagrus
Ovis orientalis
Hyaena sp.
Canis lupus
Mesocricetus cf. *auratus,* golden hamster
Ellobius cf. *fuscocapillus*
Tatera cf. *indica,* gerbil
Ochotona cf. *rufescens*
Lepus cf. *capensis*

The chart (table 4) surveying the preserved parts of the game animals is more revealing in what is absent than in what is present. There are no skulls, jaws, or limb bones other than a few fragmentary pieces; no vertebrae, scapulae, or pelves; and only a few loose foot bones. By their site classification, Hole and Flannery (1967, p. 27) indicate Warwasi probably served as a butchering station; however, it is doubtful that the hunters would carry a carcass uphill nearly 100 ft. to butcher. Nor does Warwasi fall into the category of base camp. More likely the shelter served as a lookout point and as a familiar overnight camp site for hunters tracking onagers, and was used briefly but frequently over the years. Most of the meat carried to the shelter had probably been stripped from the bones and "schlepped" in the skin. So few bones are present that any calculations of available meat are meaningless.

So sparse are these remains that the only biologic study possible on the larger game mammals was on teeth of hemiones. Since Warwasi spans a considerable time interval, it offered an opportunity to study changes in the size and pattern of the onager teeth. All upper and lower cheek teeth that were well enough preserved for the purpose were measured in the same manner as previously described for the hemiones from Palegawra (Turnbull and Reed, 1974). Lengths and widths were plotted and the patterns for the three horizons directly compared. A tendency for size decrease from Mousterian-Baradostian-Zarzian[1] stages can be shown. However, in crown characteristics the earliest Mousterian equid teeth show the same features found in the latest Zarzian specimens.

Measurements for upper and lower third molars of hemiones from Warwasi are compared with similar measurements of specimens from Palegawra cave and Recent Iranian specimens in Table 1.

The largest upper third molar is Mousterian. The largest lower third molar is also Mousterian. The smallest upper and lower third molars from Palegawra are smaller than the smallest third molars from Warwasi. The largest upper and lower third molars from Palegawra are smaller than the largest upper and lower third molars from Warwasi. In other words, the geologically older Mousterian and Baradostian hemiones from Warwasi, which

[1]Zarzian specimens referred to here are from Palegawra cave; none of the hemiones from the Zarzian of Warwasi was complete.

inhabited higher, colder, drier land, apparently possessed larger teeth – and presumably larger total bodies – than did the geologically younger hemiones from the lower, warmer, moister environs of Palegawra.

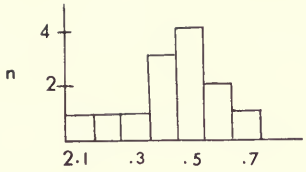
The smallest upper and lower third molars from Palegawra are smaller than the smallest Recent specimens from Iran at hand, and the largest upper and lower third molars from Warwasi are larger than the largest Recent Persian specimens. Thus, the two Recent specimens available to me fall between the Warwasi and Palegawra populations in size of teeth; it is unfortunate that the Recent sample from Iran is so small.

Cervus is confined to the earliest Mousterian deposit. *Bos* occurs in the Mousterian and Baradostian levels, but not in the Zarzian. The rarity of artiodactyl bones can be taken as evidence that the hunters were primarily interested in wild ass, and/or that the valley of the Tang-i-knisht was not particularly suitable for *Bos, Cervus, Capra, Ovis,* or *Sus. Gazella* is completely absent from these remains. Indeed, the Warwasians were hemione eaters; they were also snail eaters during the Zarzian stage (Reed, 1962, pp. 4, 10-11).

Meriones, Ellobius, Tatera, and *Microtus* are all burrowing rodents to a greater or lesser degree. All inhabit rocky, barren hillsides as well as cultivated, irrigated fields today. The presence of some of these animals at upper levels of Warwasi probably represents recent intrusion; specimens that appeared to be Recent, i.e., differently preserved, unfossilized, were not included in this study. However, the presence of *Ellobius,* for example, at depths 3-5 m. probably indicates some contemporaneity with the stratigraphy and the same holds true for other forms, all of which seemed to be fossilized. The continuous existence through this long sequence shows that, although colder and probably drier, suitable living conditions of climate and vegetation obtained during the period represented by the deposits; this also indicates the area was not heavily forested during this time, for none of these rodents are forest dwellers.

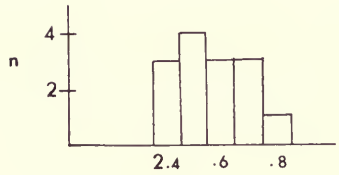
Meriones cf. *persicus* is by far the most abundant rodent collected and was found in all layers. Comparisons with Zarzian specimens from Palegawra, Iraq, and with Recent specimens collected by the 1968 Field Museum Street Expedition to Iran do not show significant size differences. See histograms, Plate I.

MERIONES

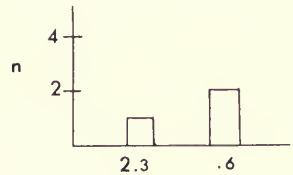


Iran
Recent

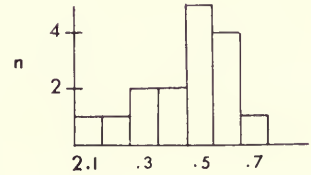
Length $M_{\overline{1}}$ mm



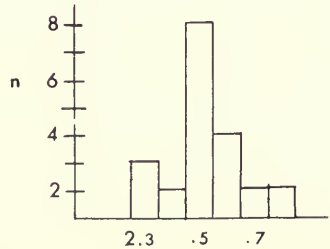
Warwasi
Zarzian



Baradostian



Mousterian



Palegawra
Zarzian

TABLE 2. Comparison of measurements of molars of three collections of jirds *(Meriones* cf. *persicus)* from the Zagros area.

	Length of mandibular alveoli of M_{1-3}	Length of M_1
Ilam, Luristan, Iran		
Recent	N=13	N=13
	OR=5.4-6.6 mm	OR=2.1-2.7 mm
	M=6.1 mm ± 0.09	M=2.4 mm ± 0.05
	s=0.35	s=0.17
	V=5.7	V=7.1
Warwasi, Kurdistan, Iran		
Zarzian	N=12	N=14
	OR=5.9-7.0 mm	OR=2.4-2.8 mm
	M=6.4 mm ± 0.10	M=2.5 mm ± 0.03
	s=0.36	s=0.13
	V=5.6	V=5.2
Baradostian	N=3	N=3
	OR=5.9-6.6 mm	OR=2.3-2.6 mm
	M=6.3 mm ± 0.22	M=2.5 mm ± 0.09
	s=0.38	s=0.17
	V=6.03	V=6.8
Mousterian	N=4	N=16
	OR=6.2-6.7 mm	OR=2.1-2.7 mm
	M=6.4 mm ± 0.12	M=2.4 mm ± 0.04
	s=0.24	s=0.16
	V=3.7	V=6.6
Palegawra, Iraq		
Zarzian	N=13	N=15
	OR=6.2-6.8 mm	OR=2.3-2.8 mm
	M=6.5 mm ± 0.03	M=2.5 mm ± 0.04
	s=0.16	s=0.13
	V=2.5	V=5.2

Ellobius is the second most numerous rodent from Warwasi, and occurs throughout the sequence. *Microtus* was found only in the Zarzian levels; *Allactaga* was found only in the Baradostian levels; *Mesocricetus* and *Tatera* were found in the Mousterian levels.

Among the Lagomorpha, hares are rare, but pikas - *Ochotona* cf. *rufescens* - are present by the score. No doubt they were an

Plate I. *Meriones persicus.* Histograms comparing lengths in millimeters of M_1 (along abscissa) in specimens from Iran (Recent); Warwasi shelter (Mousterian, Baradostian, and Zarzian stages); and Palegawra cave, Iraq (Zarzian). Number of specimens shown along ordinate. Recent specimens from the vicinity of Ilam, Luristan, Iran; altitude ca. 1460 m.

TABLE 3. Comparison of measurements of tooth-rows of three collections of pika *(Ochotona* cf. *rufescens)* from the Zagros and Elburz Mts.

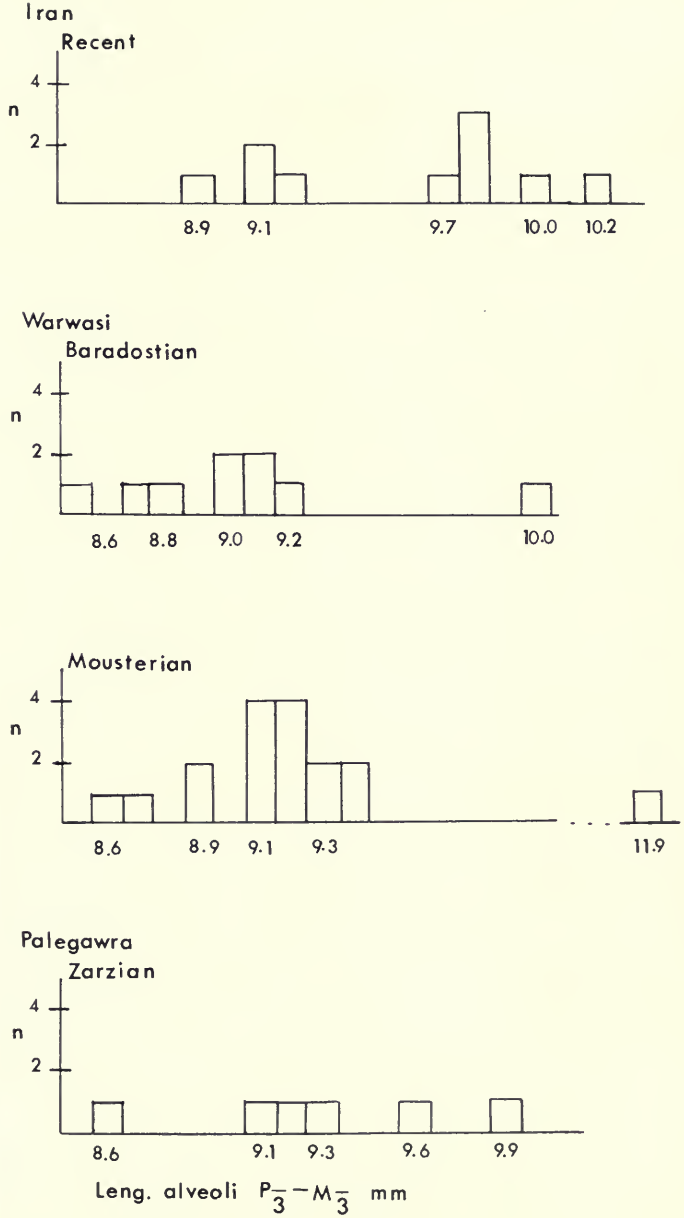
	Length mandibular alveoli P_3-M_3	Length crown P_4-M_2
Damghan, Iran	N=10	N=9
Recent	OR=8.9-10.2 mm.	OR=5.9-6.6 mm.
	M=9.6 ± 0.13	M=6.2 ± 0.09
	s=0.44	s=0.26
	V=4.5	V=4.2
Warwasi, Iran		
Zarzian	N=0	N=1
		5.9mm.
Baradostian	N=9	N=5
	OR=8.5-10.0 mm.	OR=5.2-6.1 mm.
	M=9.0 ±0.14	M=5.7 ± 0.15
	s=0.42	s=0.34
	V=4.6	V=5.9
Mousterian	N=17	N=5
	OR=8.6-11.9 mm.	OR=5.3-8.0 mm.
	M=9.3 ± 0.17	M=6.2 ± 0.46
	s=0.72	s=1.04
	V=7.7	V=16.7
Palegawra, Iraq		
Zarzian	N=6	N=4
	OR=8.6-9.9 mm.	OR=5.4-5.8 mm.
	M=9.2 ± 0.18	M=5.5 ± 0.09
	s=0.45	s=0.17
	V=4.8	V=3.1

easily obtained food source that could be caught by women and children during the sojourns at Warwasi. In Table 3 above, the absence of measurable lower jaws in the Zarzian levels does not reflect the presence of broken jaws and other post-cranial elements that actually occur in the collection.

The histograms in Plate II show the considerable variation in the length of the mandibular alveoli of *Ochotona,* which is also apparent in the ranges given in Table 3. Recent material was collected at Sang-e-Sar, 5.6 km. N. of Semnen, Damghan, Iran, by the 1962 Field Museum Street Expedition to Iran.

Plate II. *Ochotona rufescens.* Histograms comparing lengths in millimeters of alveoli of P_3-M_3 (along abscissa) in specimens from Iran (Recent); Warwasi shelter (Baradostian and Mousterian; no Zarzian specimens present suitable for measurement); and Palegawra cave, Iraq (Zarzian). Number of specimens shown along ordinate. Recent specimens from Sang-e-Sar, 5.6 km. N. of Semnen, Damghan, Iran; altitude ca. 2200 m.

OCHOTONA


Iran
Recent
n
4
2
8.9
9.1
9.7
10.0
10.2
Warwasi
Baradostian
n
4
2
8.6
8.8
9.0
9.2
10.0
Mousterian
n
4
2
8.6
8.9
9.1
9.3
11.9
Palegawra
Zarzian
n
4
2
8.6
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9.3
9.6
9.9
Leng. alveoli $P_{\overline{3}}-M_{\overline{3}}$ mm

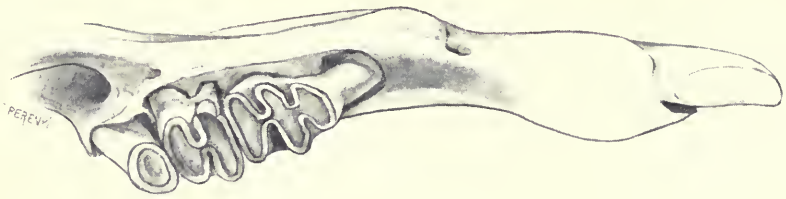

Plate III. *Meriones persicus.* Left mandible with I, M_{1-3}. PM 13067 Warwasi Shelter (Zarzian) ×6. Drawing by Tibor Perenyi, staff artist, Field Museum.

Mousterian specimens show the greatest variation in size, with a difference of 2.5 mm. in alveolar lengths between the two largest specimens. The coefficient of variation, V, for the crown lengths is high and might indicate the presence of a second, larger, species. It is noted, however, that the single extremely large ramus of *Ochotona* was found in a cleft at the bottom of the excavation. Hence it may be considerably older than the jaws found within the Mousterian layer. Specimens in the Field Museum of Recent animals from various localities in Iran show a large size range among adults. Lagomorphs, of course, possess ever-growing dentitions and the body also continues to grow for a long period of the life. Hence, despite the extreme difference in size between the largest Baradostian(10.0mm.)and largest (and stratigraphically oldest) Mousterian (11.9 mm.) mandibular alveolar lengths of *Ochotona,* it is most probable that a single species of pika is present at Warwasi throughout the layers.

CONCLUSIONS

The mammalian remains at Warwasi rock shelter bear evidence that, as in the case of the land snails studied by Reed, the wild mammalian fauna of this area has not changed very much in 40,000 years, except in size of some species. All the mammals found in these layers are represented in the region today, or were in the historic past. Size of hemiones was greater during earlier phases than in later phases. The rodent *Meriones* cf. *persicus* has not significantly changed in size. *Ochotona* cf. *rufescens* attained very large size in Mousterian time. The presence of certain rodents and the pika throughout the sequence would seem to prove that the Kermanshah valley had been sparsely bush covered during the latest Pleistocene as it is today. Warwasi sheltered the hunters primarily tracking onagers and provided an elevated view of this part of the Kermanshah valley over a very long period of time.

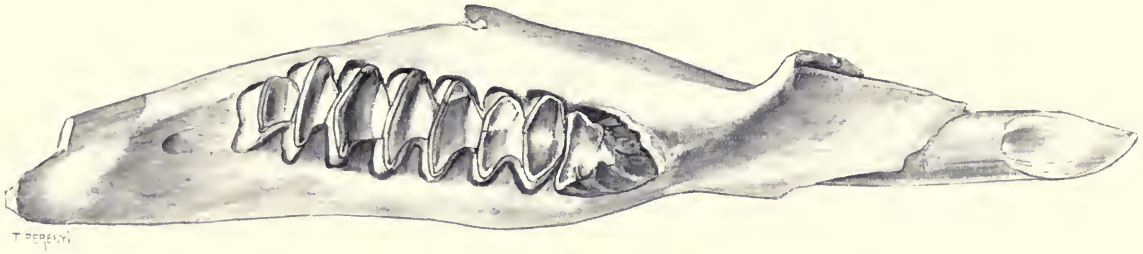

Plate IV. *Ochotona rufescens*. Right mandible with I, P_3-M_3. PM 13128. Warwasi Shelter (Baradostian). ×6. Drawing by Tibor Perenyi.

TABLE 4. Survey of Game Mammals from Warwasi Rock Shelter

Horizon / Genus and Species	Bone														Minimum number of individuals
	Horn core	Petrosal	Teeth	Vertebrae	Humerus	Radius	Ulna	Femur	Tibia	Carpal/tarsal	Metapodial	1st phalanx	2nd phalanx	3rd phalanx	Scat	
Zarzian																
Equus hemionus			7										1			2
Ovis/Capra			3		1											2
Capra aegagrus			1			1										1
Sus scrofa			1													1
Hyaena sp.													1			1
Baradostian																
Equus hemionus			37					1						1		5
Capra aegagrus			1													1
Ovis orientalis	1															1
Bos primigenius			3													1
Canis lupus														2		1
Mousterian																
Equus hemionus			72	2				1					1	1		6
Cervus elaphus			3		1				1	1	1		1	1		1
Bos primigenius			1					1								1
Ovis/Capra	4	1	6	2			1					2	2			3
Capra aegagrus		1	2							2						1
Ovis orientalis			1								2			1		1
Canis lupus			1													1
Hyaena sp.															1	1

For description of how minimum individuals were computed, see Turnbull and Reed, 1974, p. 93.

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